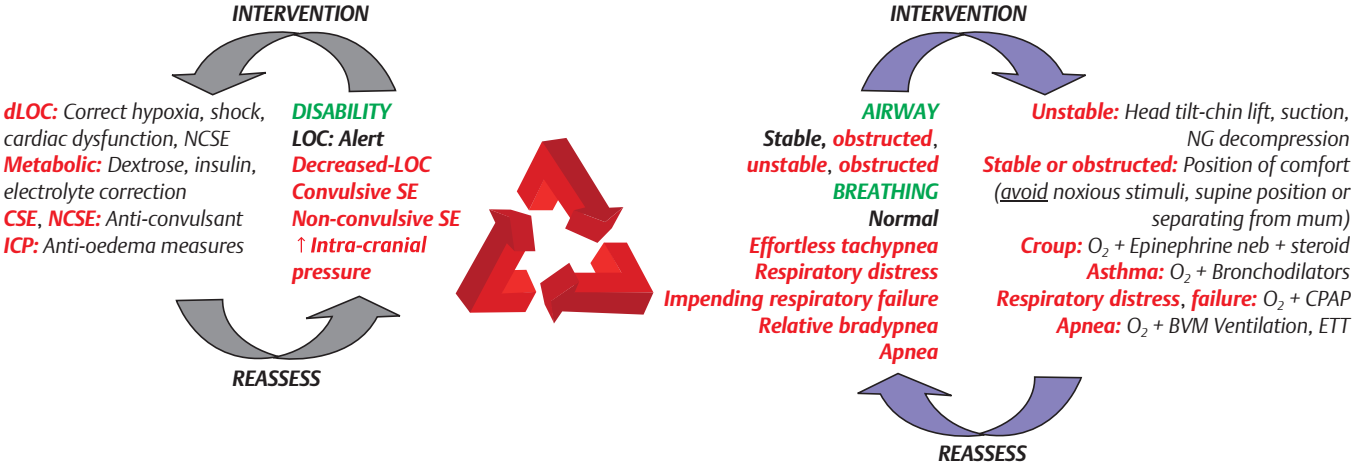
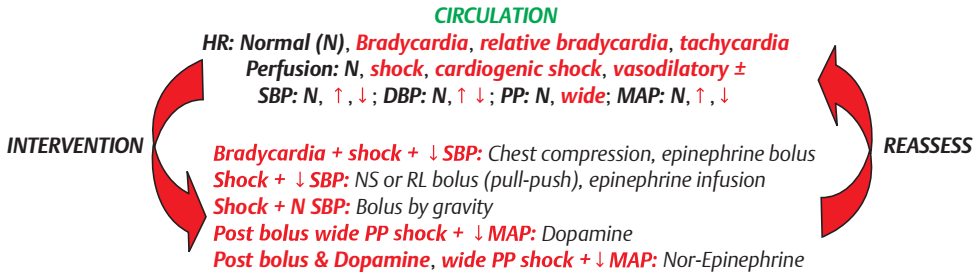
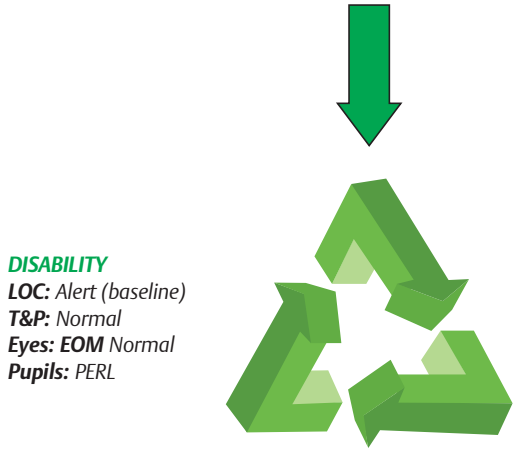
Section 2

Pediatric Resuscitation & Emergency Medication Protocols

PREM Triangle: Decision Making Tool for Resuscitation







CIRCULATION

HR: N for age; **HS:** no muffle, no gallop; **P&C:** warm, pink; **Pulses:** +++/++; **CRT** <2 secs
Liver span: N for age, soft; **SBP:** N for age; **DBP:** >50% of SBP; **Pulse Pressure:** 30–40 mmHg
MAP: N for age; **Urine output** >1 mL/kg/hour

PREM Process: After every intervention (bronchodilator, fluid bolus, intubation, anti-convulsant etc.), perform the 1-minute modified rapid cardio-pulmonary-cerebral assessment, document, interpret vital signs and derive physiological status to decide the next step. Even if 1 sign of deterioration is noted, interrupt current intervention and reconsider. If all variables show improvement, continue till therapeutic goals are achieved (green triangle).

PREM Triangle: Recognition of Relative Bradypnea, Relative Bradycardia & Relative Hypotension

Normal

DISABILITY
LOC: *Alert*
T&P: *Normal*
Eyes: *EOM*
Pupils: *PERL*

AIRWAY *Vocalize*
BREATHING ***RR:*** *N*
Grunt, stridor: *No*
Retractions: *No*
Respiration: *Thoracic*
Bilateral air-entry: *Yes*
Added sounds: *No*
SpO_2: *>94%*

CIRCULATION
HR: *N*; ***HS:*** *No muffling, no gallop*; ***P&C:*** *Warm, pink*
Pulses: *+++/++*; ***CRT:*** *<2 seconds*; ***Liver span:*** *N*
SBP: *N*; ***DBP:*** *>50% of SBP*; ***PP:*** *30–40 mmHg*; ***MAP:*** *N*

NORMAL VITAL SIGNS

Age	*Weight (kg)*	*Respiratory rate (BPM)*	*Heart rate (BPM)*	*SBP (mm Hg)*	*MAP (mm Hg)*
Neonate	3.5	30–60	90–180	50–70	45
6 months	7	24–40	85–170	65–106	
1 year	10	20–40	80–140	72–110	
3 years	14	20–30	80–130	78–114	50
6 years	20	18–25	70–120	80–115	
8 years	25	18–25	70–110	84–122	60
10 years	30	16–20	65–110	90–130	
12 years	30–40	14–20	60–110	94–136	65

NORMAL LIVER SPAN

Age	*Liver span (cm)*
2 months	5
1 year	6
2 years	6.5
3 year	7
4 years	7.5
5 years	8
12 year	9

Progressive Hypoxia/Shock

↓

Compensatory mechanisms: ↑ Respiratory rate (RR), ↑ Heart rate (HR) and ↑ Systolic blood pressure (SBP).

↓

Compensation fails: RR↓, HR↓ and SBP↓ fall to "normal range for age."

VITAL SIGNS (NORMAL RANGE) ARE *FAILING* (RELATIVE BRADYPNEA, BRADYCARDIA, HYPOTENSION) IF OTHER PARTS OF TRIANGLE ARE *ABNORMAL*

DISABILITY
LOC: *Pain or unresponsive*
T&P: *Posturing ±, floppy ±, GTCs ±*
Eyes: *Conjugate deviation ± lid twitch ±, nystagmus ±*
Pupils: *sluggish*

AIRWAY *Unstable ±, obstructed ±*
BREATHING ***RR:*** *"Normal" for age*
Grunt ±; stridor ±
Retractions: *±*
Respiration: *Abdominal ±*
Air-entry: *Bilateral*
Added sounds: *±*
SpO_2: *≤94% ±*

CIRCULATION
HR: *"Normal" for age*; ***HS:*** *muffling ±, gallop ±*; ***P&C:*** *cool, dusky*
Pulses: *++/0, +++/0*; ***CRT:*** *>2 seconds*; *Hepatomegaly*
SBP: *"Normal" for age*; ***MAP:*** *Low*

- ***Being reassured by "normal" vital signs on the monitor can be misleading and dangerous.***
- ***PREM Process: Repeated cardiopulmonary cerebral assessment, documentation, interpretation of vital signs, and derivation of physiological status (PREM triangle) are crucial to determine whether vital signs are "normal" or not. It also provides information on the trend & change in hemodynamic status.***
- ***Although, SBP may be normal or high, if diastolic BP is <50% of SBP and MAP (for age) has fallen, consider HYPOTENSION.***

National Health Mission–Strengthening of Pediatric Emergency Care System in Tamil Nadu–Establishment of Pediatric Resuscitation and Emergency Units under Tamil Nadu Accidents and Emergency Care Initiative under the name of PREM G.O(D)No. 539.

Triage & Resuscitate Using PREM Triangles

NORMAL PHYSIOLOGICAL STATUS

DISABILITY
LOC: Alert
T&P: N
Eyes: EOM
PERL

AIRWAY Stable (vocalizes)
BREATHING RR: N
Grunt, stridor: No
Retractions: No
Respiration: Thoracic
Air-entry: +
Added sounds: No
SpO_2: >94%

CIRCULATION
HR: N (for age); **HS:** No muffling or gallop; **P&C:** Warm, pink sole of foot
*__Pulses__ +++/++; **CRT:** <2 seconds; **Liver span:** N; **Blood Pressure: SBP N**
Diastolic BP: <50% SBP; **Pulse Pressure:** 30-40 mm Hg, **MAP:** N

*__Pulses: Femoral (F) & Dorsalis Pedis (DP) +++/++ means both normal volume__
Note: +++/+++ F = DP; ++/0 or +/0 = weak FP but no DP

PREM Terminology & Definitions:

- **Breathing normal = Normal RR + normal work of breathing**
- **Respiratory distress = Increased RR + retractions**
- **Impending respiratory failure = Grunt + respiratory distress**
- **Relative bradycardia = Heart rate within normal range for age - whilst other sides of the triangle are abnormal**
- **Wide pulse pressure = SBP-DBP >40 mm Hg**
- **Vasodilatory shock = DBP <50% SBP + wide PP with or without low MAP**
- **Mean arterial pressure = DBP + one-third pulse pressure**
- **Liver span = Mark lower border along right costal margin, percuss & mark upper border for liver dullness. Measure span (cm) in the mid-clavicular line. Check lower border & remeasure span after every intervention.**
- **Non-convulsive status epilepticus = LOC: Responsive to pain or unresponsive + 1 or more abnormal EOM: Conjugate deviation, nystagmus, lid twitch**

RESPIRATORY DISTRESS

DISABILITY
LOC: Alert
T&P: N
Eyes: EOM
PERL

AIRWAY Stable
BREATHING RR: ↑
Grunt, stridor: ±
Retractions: +
Respiration: Thoracic
Air-entry: +
Added sounds: ±
SpO_2: >94%

CIRCULATION
HR: ↑±; **HS:** N; **P&C:** Warm, pink; **Pulses:** +++/++
CRT: <2 seconds; No shock; **Liver span:** N
SBP: N; **DBP:** N; **PP:** N; **MAP:** N

CARDIAC FAILURE

DISABILITY
LOC: Alert
T&P: N
Eyes: EOM
PERL

AIRWAY Stable
BREATHING RR: ↑
Grunt, stridor ±
Retractions: +
Respiration: Thoracic
Air-entry: +
Added sounds: ±
SpO_2: >94%
(Exception: CCHD)

CIRCULATION
HR: Tachycardia; **HS:** N; **P&C:** Warm, pink or dusky
Pulses: +++/++; **CRT:** <2 seconds; No shock;
Hepatomegaly; **SBP:** N; **DBP: low**; **PP: Wide** (shunt lesion); **MAP:** N

VASODILATORY CARDIOGENIC SHOCK (MAP N)

DISABILITY
LOC:
Incessant cry ±
Not usual self ±
Lethargic ±
Sleepy ±
T&P: N
Eyes: EOM
PERL

AIRWAY Stable
BREATHING RR: N
Grunt, stridor: ±
Retractions: +
Respiration: Abdomnal ±
Air-entry: +
Added sounds: ±
SpO_2: ≤94% ±

CIRCULATION
HR: Tachycardia; **HS: muffling ±, gallop ±**
P&C: Warm, pink; **Pulses: +++/+++**; **CRT: instant**; **Shock**
Hepatomegaly ±; **SBP:** ↑ ; **DBP:** ↓ ; **PP: Wide**; **MAP:** N